

DRAFT

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:

Species or Hatchery Stock:

Agency/Operator:

Watershed and Region:

Date Submitted:

Date Last Updated:

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Quilcene Coho Net Pen program

1.2) Species and population (or stock) under propagation, and ESA status.

Coho salmon (*Oncorhynchus kisutch*), Quilcene stock. ESA status: Part of the Puget Sound/Georgia Strait ESU that is currently a candidate species.

1.3) Responsible organization and individuals

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On-site operations staff lead:

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Point No Point Treaty Council: Technical assistance since the hatchery operations began in late 1976. Northwest Indian Fisheries Commission: Fish health services. Washington Department of Fish and Wildlife: Co-manager and provides fish feed for project. U.S. Fish and Wildlife Service: Source of net pen coho smolts from Quilcene National Fish Hatchery. U.S. Navy: Provides fish transport from land to net pen in Quilcene Bay.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Source: Bureau of Indian Affairs through Skokomish Tribe

Staffing: Lloyd Wilbur Jr.: Hatchery Manager

Operational costs:

1.5) Location(s) of hatchery and associated facilities.

The coho net pen is anchored at the southeast end of Quilcene Bay near Fisherman's Point. The net pen is supported by a steel framework on plastic foam-filled floats. It is a 50-foot square by 40-foot deep net with ½-inch mesh.

1.6) Type of program.

Isolated Harvest

1.7) Purpose (Goal) of program.

Fisheries augmentation. The goal of the program is to provide coho salmon fishing opportunity, promoting the stability and viability of treaty and non-treaty fisheries.

1.8) Justification for the program.

The Quilcene coho net pen program has produced a return of adult salmon since its first release of coho smolts in 1986. The coho salmon have provided opportunities for treaty and non-treaty harvest in pre-terminal areas as well as in Hood Canal and Quilcene Bay.

The program exists as a cooperative effort between the Skokomish Tribe (Tribe), Washington Department of Fish and Wildlife (WDFW), and U.S. Fish and Wildlife Service (USFWS). Eggs are collected by USFWS from broodstock of the Quilcene National Fish Hatchery located in the Big Quilcene River basin. (The Big Quilcene River flows into Quilcene Bay on the west side of central Hood Canal). The eggs are incubated and hatched, and the fry are reared to smolts in the same hatchery before transfer to the Quilcene Bay coho net pen. The net pen receives the coho smolts in January where the fish are acclimated and reared until release in April or May. Operation and maintenance of the net pen facilities is the responsibility of the Skokomish Tribe. However, fish feed is provided by the Washington Department of Fish and Wildlife. Acclimation of the coho smolts in the net pen provides for localized returns to Quilcene Bay to the benefit of the Tribe. The net pen provides a vessel for extended rearing that increases Hood Canal hatchery coho production to the benefit of all intercepting fisheries.

The coho smolts are released from the net pen directly into Quilcene Bay. Hood Canal summer chum, listed as a threatened species under the Endangered Species Act, occur in the Big Quilcene and Little Quilcene rivers that flow into the bay. Potential interactions between the coho and summer chum are possible in the rivers and estuary. The Quilcene coho net pen program follows applicable risk avoidance measures described in the Summer Chum Salmon Conservation Initiative (SCSCI)(WDFW and Point No Point Treaty Tribes 2000). These measures, addressing potential effects from coho predation and fish disease transfer, are included in the performance standards described below in section 1.9 and are described in more detail in sections 2.2.1 and 3.5. The risk aversion measures pertaining to fish disease may also apply to Puget Sound chinook, another species listed as threatened.

1.9) List of program “Performance Standards” and**1.10) List of program “Performance Indicators”, designated by "benefits" and "risks."**

The following performance standards and associated performance indicators apply to the Quilcene coho net pen program. Note that broodstock collection, egg take and freshwater rearing of the coho are performed at the USFWS’ Quilcene National Fish Hatchery and therefore, performance standards and performance indicators for those activities are not included here.

Categories	Performance Standards	Performance Indicators
Fish Production	1) Release goal of 200,000 smolts at 15 fish per pound.	1) Estimates of fish numbers and size, and records of fish culture (e.g., mortalities, growth, feeding, disease incidents, etc.) - (“benefits”)
	2) Return rate goal of 0.05 or better, potentially contributing at least 10,000 coho to fisheries.	2) Collection of catch and escapement data. Coded wire tagging and sampling. Cohort analysis to reconstruct runs. (“benefits”)
	3) Production goals consistent with the provisions of the Puget Sound Salmon Management Plan, the Hood Canal Salmon Management Plan and all other management agreements of the Co-managers.	3) Coho net pen release records consistent on average with future brood document and other provisions of co-managers’ agreed upon management plans and policies. (“benefits”)
Hatchery Fish Rearing	3) Goal is to rear fish in a relatively stress-free environment that promotes good growth and survival so that when released, the fish will be healthy and in good condition.	3) Estimates of fish numbers and size, fish mortality counts, fish loading, water temperature measurements, plankton samples (to check noxious phytoplankton levels), feeding and growth rates. (“benefits”)
Hatchery Fish Release	4) Goal is to release fish in a group during an outgoing tide to encourage rapid dispersion and reduce potential predation on newly released smolts.	4) &5) Records of date, time, tide and general environmental conditions at release. Also, estimates of fish numbers and size, and assessment of fish condition at release. (“benefits” and “risks” – the “risks” refers to risk aversion measure of releasing smolts after April 15 to protect summer chum from possible coho predation effects.)
	5) Fish released after April 15 to avoid interaction with summer chum salmon.	

Disease Control	6) Hatchery practices implemented consistent with the Co-managers' Washington Salmonid Disease Control Policy's procedures.	6,7 & 8) Reports by fish disease professional on fish disease monitoring, including disease incidents and treatments. Certification by fish disease professional of fish health and condition at release. ("benefits" and "risks" – the "risks" associated with protecting listed species from potential disease transfer.)
	7) Fish health monitored by fish health professional of the Northwest Indian Fisheries Commission during rearing operations. Measures implemented to prevent and treat fish disease as recommended by the fish health professional.	
	8) Fish released in healthy condition.	
Natural Coho	9) Stray rates to streams outside Quilcene Bay at acceptable rates (to be determined). This performance standard is under consideration and would be implemented only as part of a large-scale effort including other hatchery facilities.	9) Perform spawner surveys and estimate stream escapements. Also, sample spawners/carcasses for adipose fin clips and coded wire tags, and possibly collect fish scales from carcasses. Based on assessment of data, identify proportion of hatchery fish in stream escapements. ("risks")

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish). See HGMP addressing coho salmon for Quilcene National Fish Hatchery.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Quilcene Bay	200,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Cohort analyses using coded wire tag, catch and escapement data have been completed for Hood Canal coho stocks, providing estimates of December Age-2 recruits (Beattie et al. 1999, PNPTC and WDFW 2000). The December Age-2 recruits comprise the population of coho that exist in December of the second year of coho life, just prior to the coho entering the gauntlet of fisheries that occur as they return to home streams. This estimate of recruits is the total of the resulting catches (U.S. and Canadian), mortalities (primarily natural mortality but also low levels of non-landed fisheries mortalities) and escapement. The following table shows estimates of smolts released, December Age-2 recruits, run sizes, escapements and survival rates for the years 1988 through 1998. No brood 1994 coho smolts were transferred to the net pens in 1996; therefore, no smolts were released and there were no 1997 fish returns. Note that estimates of recruits, run sizes and escapements for the year 1998 were not available at the time this table was prepared.

Return Year	Smolts Released	December Age-2 Recruits /1	Run Sizes /2	Escapements /3	Survival Rates /4
1988	85,570	4,360	3,230	350	.0377
1989	193,520	16,070	11,890	760	.0614
1990	146,000	30,270	22,400	270	.1530
1991	311,330	21,480	15,900	200	.0511
1992	266,190	7,830	5,790	290	.0218
1993	353,260	18,200	13,470	570	.0381
1994	337,800	24,900	18,430	1,430	.0546
1995	287,190	8,380	6,200	1,650	.0216
1996	216,740	1,860	1,380	290	.0064
1997	0	0	0	0	-
1998	220,000	N.A.	N.A.	N.A.	N.A.
Average	219,780	13,330	9,870	580	.0495

/1 Values (to the nearest 10) are taken from Table A-3-c of the report by PNPTC and WDFW (2000).

/2 Run size (to the nearest 10) is the estimated total catch plus escapement. Run size values have been approximated by assuming December Age-2 recruits experience an average total natural mortality rate of 0.26 (N. Lampsakis, personal communication) and by ignoring low level non-landed mortalities. Run size is calculated as follows: Run Size = December Age-2 Recruits x (1.0 - 0.26).

/3 Escapements have been approximated based on estimates of net pen coho returns to Quilcene National Fish Hatchery (located on the Big Quilcene River) and to streams of Quilcene Bay. Net pen returns to the hatchery are estimated by proportion of tagged net pen fish observed in the total hatchery escapement. Returns to the streams are estimated by assuming net pen stray rate is the same as for the hatchery (i.e., proportion of net pen strays in estimated stream escapements is same as net pen stray proportion estimated at hatchery) (Nick Lampsakis, personal communication).

/4 Survival rates have been calculated by dividing estimated run size by estimated smolts released.

1.13) Date program started (years in operation), or is expected to start.

The program began with release of brood 1984 coho smolts in the spring of 1986 and has been in operation for 14 years.

1.14) Expected duration of program.

No limit on the duration of the program has been set.

1.15) Watersheds targeted by program.

The Quilcene coho net pen is located in Quilcene Bay.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

The Quilcene coho net pen is tribally owned. A net pen location in southern Hood Canal was considered but was abandoned after strong local opposition was expressed. The Quilcene Bay location in central Hood Canal was selected because of limited exposure to wind and storms, the willingness of local people to accept the project, and because it would support an extreme terminal coho fishery for the Skokomish and other Point No Point Treaty Tribes. Relative ease of access for net pen operations and maintenance was another consideration.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None in hand; ESA listings are new in this area.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

There are no direct takes of listed species by the program. Hood Canal summer chum (ESA-listed Threatened species) are found in the Big and Little Quilcene rivers on Quilcene Bay. There is the potential for interactions between the net pen coho and the summer chum as both juveniles (in the estuary) and adults (in the streams and estuary). Chinook, another ESA-listed threatened species, are not currently produced in the streams of Quilcene Bay, though juveniles may make use of the Quilcene estuary during their migration to sea and, therefore could possibly interact with net pen coho. Potential interactions can be controlled with implementation of appropriate risk aversion measures (see below, section 3.5).

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Two listed species may be subject to indirect effects from the program - Hood Canal summer chum salmon and Puget Sound chinook. Summer chum are found in Big and Little Quilcene rivers and other streams of Hood Canal and eastern

Strait of Juan de Fuca. Chinook are found in the southwestern Hood Canal streams (the nearest being the Dosewallips River) and streams along the Strait. Potential interactions with coho from the net pens may occur in the local streams with summer chum or in the estuary with summer chum and chinook. Detailed descriptions of the listed species, including life histories are contained in the Summer Chum Salmon Conservation Initiative (WDFW and Point No Point Treaty Tribes 2000), the Status Review of Chum Salmon from Washington, Oregon, and California (Johnson et al. 1997) and the Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California (Myers et al. 1998).

- Identify the ESA-listed population(s) that will be directly affected by the program.
None.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

The coho yearlings released from the net pens may incidentally affect the listed chinook by preying upon or competing with the chinook juveniles and by potentially serving as a vector for disease transfer. The coho yearlings could also affect summer chum fry by preying upon them or by possible disease transfer, but this is unlikely due to the late time of the coho release relative to the summer chum emigration period (WDFW and PNPT Tribes 2000).

The program may incidentally affect returning adults of the listed species. The returning coho of Quilcene stock are early-timed, entering freshwater at approximately the same time period as summer chum, and therefore could interact with the summer chum when the coho stray into the Big and Little Quilcene rivers. However, while some coho spawn in the Big Quilcene River, the majority tend to proceed upstream directly to the hatchery. This behaviour limits the interaction with summer chum that spawn downstream in the river. Coho may enter the Little Quilcene River and spawn in the same general areas as the summer chum but little is currently known about any interactions. Overall, the risks to summer chum appear low (Table 3.14, section 3.3 of SCSCI). Adult coho could stray into chinook streams but, because those streams are removed from Quilcene Bay and because coho and chinook tend to select different spawning habitat, there appears to be low risk of interactions.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds.

The Co-managers have recently identified chinook in Hood Canal as falling into two categories. Chinook of the Skokomish, Lilliwaup, Hamma Hamma, Duckabush and Dosewallips rivers are in Category 2, where the existing population is not indigenous but where historical information indicates a sustainable population did at one time exist. These populations are each being

managed to recover a locally adapted, naturally sustaining population over the long term. The existing chinook populations in streams of the west Kitsap peninsula are in Category 3, where it has been determined that historically a sustainable population did not exist. The existing populations are the result of hatchery outplanting or straying and are not being managed as sustainable populations.

The SCSCI provides two assessments of summer chum salmon stock status. The first is a reevaluation of the 1992 Salmon and Steelhead Stock Inventory (SASSI) (WDF et al. 1993). The results of that reevaluation show the status of 16 Hood Canal and Strait of Juan de Fuca stocks distributed as follows: seven extinct, two critical, five depressed, one healthy and one unknown. The second assessment considers stock extinction risk following a procedure described by Allendorf et al. (1997); its results showed the nine existing stocks' current status to be distributed as follows: four at low risk, two at moderate risk, two at high risk, and one of special concern.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Not applicable. The Quilcene coho net pen program does not produce a listed species and there are no direct effects on any listed population by the program.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Not applicable.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Not applicable.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

There is no direct take of listed species. The release of coho from the Quilcene coho net pen program may lead to interactions with listed species associated with predation, competition, behavioral modification and disease transfer. See below section 3.5.

- Provide information regarding past takes associated with the hatchery program,

(if known) including numbers taken, and observed injury or mortality levels for listed fish.

There is no direct take and no information exists upon which to base quantified estimates of possible indirect take. The risk of indirect take appears low. Table 1 is not applicable.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

There appears to be low risk of any take (see above and section 3.5).

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review Report and Recommendations* - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

This program is fully consistent with the guidelines, protocols, and implementation of the Co-manager's Summer Chum Salmon Conservation Initiative (SCSCI) (WDFW et al. 2000). The applicable part of the SCSCI addressing potential interaction of the summer chum with hatchery fish is section 3.3.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

This HGMP is consistent with all relevant standing orders and agreements. The Puget Sound Salmon Management Plan (PSSMP) and the Hood Canal Salmon Management Plan (HCSMP) are federal court orders that currently control both the harvest management rules and production schedules for salmon in Hood Canal under the *U.S. v. Washington* management framework.

3.3) Relationship to harvest objectives.

The fishery production goal of the Quilcene coho net pen program is consistent with the fisheries management objectives and measures defined in the Summer Chum Salmon Conservation Initiative (WDFW and PNPT Tribes 2000) to protect Hood Canal summer chum. The "base conservation regime" for managing harvest includes no fisheries directed at summer chum. The total incidental fishery harvest rate expected under the Summer Chum Salmon Conservation Initiative is 10.8% (with a range of 3.3% to 15.3%). These rates reflect the incidental fishery harvest levels of all Canadian and U.S. fisheries. Specific provisions to control fisheries directed at coho, including Quilcene net pen coho, are described in the "base conservation regime" and are being implemented by the Co-managers.

Management measures to protect Puget Sound chinook are being addressed in the

Comprehensive Chinook Planning process initiated by the Co-managers and working with the National Marine Fisheries Service's staff. The NMFS issued a Section 7 permit for the 1999 chinook fishing season. Currently, work is progressing on a Fisheries Management and Evaluation Plan to apply for a take exemption under the 4(d) rule. The Quilcene coho net pen program is consistent with current management objectives and practices to protect Puget Sound chinook.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Fisheries benefiting from the program include U.S and Canadian fisheries, commercial and recreational. The coho harvest in Quilcene Bay is treaty and non-treaty net fisheries catch. The following table provides estimates of total harvest, Quilcene Bay harvest and total harvest rate from 1988 through 1997. Note that the absence of harvest for the year 1997 is due to the fact that no 1994 brood coho were released from the net pen in 1996. Coho production at the Quilcene National Fish Hatchery was very low for that brood year and no smolts were transferred to the net pens. Information for years after 1997 was not available at the time this table was prepared.

Return Year	Estimated Total Harvest /1	Quilcene Bay Harvest /2	Total Harvest Rate /3
1988	2,880	170	.89
1989	11,130	1,130	.94
1990	22,130	2,520	.99
1991	15,700	870	.99
1992	5,500	60	.95
1993	12,900	30	.96
1994	17,000	4,250	.92
1995	4,550	260	.73
1996	1,090	270	.79
1997	0	0	-

/1

Total harvest has been calculated by subtracting escapement from run size. Estimated run size and escapement values and their sources are described in the table of section 1.12.

/2 Quilcene Bay harvest values (to the nearest 10) are from coho cohort run reconstruction data records (N. Lampsakis, personal communication).

/3 Harvest rates have been calculated using the following equation:

$$\text{Harvest Rate} = \frac{\text{Total Harvest}}{\text{Run Size}}$$

Note that run size values are provided in table of section 1.12.

3.4) Relationship to habitat protection and recovery strategies.

The Quilcene coho net pen program is not related to any habitat protection and recovery strategies for Hood Canal summer chum or Puget Sound chinook.

3.5) Ecological interactions.

The release of coho into Quilcene Bay and their entry into other estuarine areas may lead to interactions with the listed species. Potential effects on the listed summer chum would be through predation of coho on the summer chum in the estuaries and disease transfer. Specifically where, when and if such effects may occur is unknown. The potential risk of a take appears low (see section 3.3 of SCSCI), especially with implementation of the risk aversion measures described below in sections 9.2.10, 10.11 and 11.2.

Coho yearlings released by the program may prey upon or compete with listed fall chinook in the estuary and potentially could be a source of disease infection to the chinook. Where, when and if such effects may occur is unknown. The risk of a listed chinook take from disease transfer appears to be low, given the risk aversion measures taken with respect to disease control (sections 9.2.10, 10.11 and 11.2).

Coho adult returns from Quilcene net pen released coho are expected to present a low risk of interacting with the listed summer chum or chinook because coho have different spawning habitat preferences (see also section 2.2.1)

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The saltwater of Quilcene Bay is the water source for the Quilcene coho net pen program. The net pens are located at the southeastern end of the bay to take advantage of the flushing effect of the tidal exchange as water moves in and out of the bay. Surface water temperatures are generally in the high 40s to low 50s Fahrenheit, but can increase into the high 50s and 60s in May and June. The primary risks to the coho are potential increased stress at higher temperatures and possible blooms of noxious phytoplankton. Temperatures are monitored. Phytoplankton was once monitored and should now again be monitored (requires training of existing hatchery personnel). Fish are released if temperature or noxious phytoplankton abundance appears to be a threat.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Program water requirements and use are not a risk to listed species.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Not applicable to Quilcene coho net pen program. The U.S. Fish and Wildlife Service, a program co-operator, collects eggs used in the net pen program (see section 1.8) at the Quilcene National Fish Hatchery as part of its own hatchery coho program that includes broodstock collection.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

The U.S. Fish and Wildlife Service transports the coho yearlings by tanker truck from the Quilcene National Fish Hatchery to a dock at the north end of Quilcene Bay. The coho are off-loaded from the trucks by hose into approximately 8' x 8' x 3' metal frame, plastic-lined tanks placed on a U.S. Navy transport vessel. (Recently, the U.S. Navy has volunteered to assist in the transport-across-water phase of the project by providing a water transport vessel and crew.) The water in the tanks is aerated using air stones and bottled oxygen. The fish are immediately transported to the net pen facilities where fish are placed in a net pen by hose from the holding tanks. Transport over water takes 10 to 15 minutes.

5.3) Broodstock holding and spawning facilities.

Not applicable. See USFWS Quilcene National Fish Hatchery's coho program.

5.4) Incubation facilities.

Not applicable. See USFWS Quilcene National Fish Hatchery's coho program.

5.5) Rearing facilities.

The net pen is 50' square by 30' deep with ½" mesh. The pen is hung from a stainless steel framework that is supported by foam-filled plastic floats and anchored to the bottom of the bay. A bird net, to protect against bird predators, is suspended above the net pen. Walkways on the framework, along the periphery of the net pen, accommodate fish feeding, equipment maintenance, and periodic coho weight and fish health sampling. A solar-powered, photo-cell controlled navigation light is placed on the pens to meet U.S. Coast Guard requirements.

5.6) Acclimation/release facilities.

Fry are released from the net pens after acclimating in Quilcene Bay for several months.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

Potential operational hazards and problems fall into three categories:

- 1) Noxious phytoplankton A bloom of the diatom *Chaetoceros sp.* occurred the second year of the project (1987) causing high mortalities (roughly estimated to be 65%). In 1989, another *Chaetoceros sp.* bloom occurred late in the rearing period and fish were released immediately (mortality was estimated at 5%). Subsequently, there have been no early releases or mortalities associated with noxious phytoplankton. Two factors likely contribute to the absence of noxious phytoplankton problems in recent years. First, the net pen depth has been

increased from 25' to 30'. Since the blooms are usually located near the surface, the 20% more depth may provide additional refuge from any blooms that may occur. Second, the switch from Dungeness stock to a Hood Canal stock in 1993 has generally resulted in earlier fish arrival and earlier release, potentially avoiding any blooms in late May and June.

- 2) Vibrio disease The bacterium, *Vibrio anguillarum*, has in past years been a problem, causing mortalities and poor condition of the coho and requiring treatment. However, a vibrio vaccine, administered by adding the vaccine to water during transport by tanker truck to the pens, has been successful in controlling the disease in recent years.
- 3) Equipment failure On occasion, an anchor line has failed and required replacement during program operation. No known fish loss has occurred as a consequence of these failures. Regular monitoring of the anchoring equipment's condition has all but eliminated this problem.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Failure of the Quilcene coho net pen program is not expected to directly affect any listed fish. However, if an accident causes damage to the net pens allowing fish to escape early, or if a noxious phytoplankton bloom necessitates an early release, the risk of coho yearlings interacting with the listed species increases. In cases where a release occurs before mid-April, the coho could enter the estuary at the time when summer chum are still present and increase the risks of coho predation on summer chum fry and of disease transfer. An early release could also increase the potential for interactions with listed chinook juveniles.

Risk of early release is best averted by closely monitoring the program operation to recognize any potential problems immediately; e.g., a broken anchor line, or damaged net. Also, regular maintenance of the facilities reduces the risk of equipment failure.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

The current broodstock source is Quilcene coho collected by USFWS at the Quilcene National Fish Hatchery.

6.2) Supporting information.

6.2.1) History.

From 1986 through 1992 the broodstock source was Dungeness River stock from the WDFW Dungeness Hatchery. The Co-managers then decided the broodstock source should be from within the Hood Canal region and the Quilcene stock was chosen. A transition period occurred for two years, 1993 and 1994, when George Adams stock was used. Beginning in 1995 and extending to the present, the source of smolts for the project has been Quilcene stock, spawned, hatched and reared at Quilcene National Fish Hatchery.

6.2.2) Annual size.

Not applicable to this program.

6.2.3) Past and proposed level of natural fish in broodstock.

Not applicable to this program.

6.2.4) Genetic or ecological differences.

Not applicable to this program.

6.2.5) Reasons for choosing.

The Quilcene stock was chosen because of its immediate proximity to the net pens, the size and quality of coho adult returns, and the stock's availability. The only other alternative hatchery stock in Hood Canal was George Adams stock located in the Skokomish River at the south end of Hood Canal.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Not applicable to this program. Broodstock selection occurs at Quilcene National Fish Hatchery as part of its coho program.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults are collected at Quilcene National Fish Hatchery as part of its coho program..

7.2) Collection or sampling design.

Not applicable to this program.

7.3) Identity.

Not applicable to this program..

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

Not applicable to this program. See coho program of Quilcene National Fish Hatchery.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: See coho program for the Quilcene National Fish Hatchery..

Brood Year	Adults Females	Males	Jacks	Eggs	Juveniles
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					

(Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Not applicable to this program. See coho program of Quilcene National Fish Hatchery.

7.6) Fish transportation and holding methods.

Not applicable to this program.

7.7) Describe fish health maintenance and sanitation procedures applied.

Not applicable to this program.

7.8) Disposition of carcasses.

Not applicable to this program.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Not applicable to this program.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

Mating occurs at Quilcene National Fish Hatchery. This section is not applicable to the Port Gamble coho net pen program.

8.1) Selection method.

Not applicable.

8.2) Males.

Not applicable.

8.3) Fertilization.

Not applicable.

8.4) Cryopreserved gametes.

Not applicable.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Not applicable.

SECTION 9. INCUBATION AND REARING -

Specify any management goals (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

Incubation and then rearing in freshwater to smolt stage occurs at Quilcene National Fish Hatchery. For information on incubation and freshwater rearing, see coho programs for the Quilcene National Fish hatchery. See also section 1.8 for description of participation by agencies and Tribe in this cooperative coho production effort.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Not applicable to this program.

9.1.2) Cause for, and disposition of surplus egg takes.

Not applicable.

9.1.3) Loading densities applied during incubation.

Not applicable.

9.1.4) Incubation conditions.

Not applicable.

9.1.5) Ponding.

Not applicable.

9.1.6) Fish health maintenance and monitoring.

Not applicable.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not applicable.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

The following survival rate estimates apply only to the saltwater rearing phase of coho production. Freshwater rearing occurs at Quilcene National Fish Hatchery. No fish were released from the net pen in 1996; therefore no survival rate estimate is shown for that year.

Release Year	Saltwater Rearing Survival Rate /1
1988	.99
1989	.94
1990	.99
1991	.99
1992	.99
1993	.97
1994	.99
1995	.94
1996	-
1997	.98
1998	.94
1999	.99

/1 Estimated survival rate is calculated as shown in the following equation:

Survival rate = (total smolts to pens – observed mortalities) ÷ total smolts to pens

9.2.2) Density and loading criteria (goals and actual levels).

Approximately 200,000 coho are loaded into the net pen, measuring 50' square by 30' deep (75,000 cubic feet). At maximum loading, when fish reach the target release size of 15 fish per pound, the fish would weigh approximately 13,300 pounds and the loading would be 0.18 pounds per cubic foot. Experience has shown that with the tidal circulation at the net pen site, this is a safe loading level.

9.2.3) Fish rearing conditions

The fish are monitored for mortalities, aberrations in behavior and morphological changes that may indicate stress, disease or possible other negative impacts. Water temperatures are monitored and the intent is to also monitor phytoplankton (see section 4.1). Any problems are addressed immediately. Weight samples to estimate fish size are collected every week and a diver also checks the net pen for mortalities weekly.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available. Weight samples are taken every week measuring fish per pound; however, historical records have not been retained. Generally fish are received at a size of 30 to 20 fish per pound and released at a size close to 15 fish per pound. The fish approximately double in weight during the saltwater rearing period of three to four months.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing.

Fish are fed dry feed three times per week. Feed size varies from 1.5 to 2.5 mm pellets. The daily feeding rate is 2.5 % B.W. and is based on total pounds of fish estimated from weekly weight samples. No historical records of weight samples or daily feed volumes exist from which food conversion efficiency may be estimated.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

The coho are reared under the guidance of certified fish health personnel from NWIFC and in accordance with the Co-Manager's Salmonid Disease Control Policy (NWIFC and WDFW 1998). The hatchery crew monitors fish for signs of disease by observing feeding and swimming behavior, daily mortality trends and general fish appearance. A fish disease professional inspects the fish shortly after pen loading, just prior to release, and at any time the hatchery crew detects any disease or unaccountable signs of fish stress and requests assistance. The prophylactic measure of adding *Vibrio* vaccine to the water of tanker trucks during transport of coho smolts from the hatchery to the pens has successfully controlled the incidence *Vibrio* outbreaks.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not applicable.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

The coho salmon are being acclimated in marine waters before release.

Opportunities may exist for feeding on natural prey that pass through the net pens, or on organisms of the fouling community attached to or associated with the pen net.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

No adverse genetic or ecological effects on listed species are anticipated from rearing of the coho. Disease prevention and treatment measures (section 9.2.7) are taken to minimize risk of fish disease transfer to listed species of Hood Canal summer chum and Puget Sound chinook.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	200,000	15	April - May	Quilcene Bay

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Not applicable

Release point: Southeastern end of Quilcene Bay (Marine release site no. 88.4020)

Major watershed: Quilcene Bay

Basin or Region: Hood Canal

10.3) Actual numbers and sizes of fish released by age class through the program.

The following table shows total Quilcene coho net pen releases from 1988 through 1999 from records maintained by the Tribe, Point No Point Treaty Council and Northwest Indian Fisheries Commission.

Release year	Eggs/ Unfed Fry	Avg size	Fry (nearest 10K)	Avg size (fish/lb)	Fingerling	Avg size	Yearling	Avg size (fish/lb)
1988							193,500	13
1989							146,000	19
1990							311,300	11

Release year	Eggs/ Unfed Fry	Avg size	Fry (nearest 10K)	Avg size (fish/lb)	Fingerling	Avg size	Yearling	Avg size (fish/lb)
1991							266,190	12
1992							353,260	17
1993							337,800	24
1994							287,190	18
1995							216,740	13
1996							0	-
1997							220,000	17
1998							225,270	14
1999							189,950	13
Average							228,930	16

The numbers released are inconsistent over the years because of changes in production goals, fish loss while in net pens, and varying availability of smolts. When the net pen project was first initiated in 1986, an interim production goal was set at 250,000 smolts per year, with the expectation that the production level would increase to 400,000 after some experience with the project had been gained. In 1990, the production goal was raised to 400,000. However, by 1996 it was recognized that the 400,000 release goal had never been achieved (owing primarily to available numbers of coho smolts from freshwater hatchery) and it was determined that with the change to Quilcene stock, reared at the Quilcene National Fish Hatchery, a lower goal was more appropriate given the available rearing capacity at that hatchery. The goal was lowered to 300,000 smolts and then lowered again in 1999 to 200,000 smolts. Generally, few fish are lost in the interim between transfer to the net pens and fish release (see table in section 9.2). However, losses did occur in 1987 and 1989 associated with noxious phytoplankton blooms (see section 5.7) and reduced the total release for those years. A major factor for variation in release numbers is changing availability of smolts from the freshwater facility. These changes are associated with unexpected fish losses, lower than anticipated broodstock fecundities in some years, and uncertainty about the hatchery's production capacity. The last factor applies to Quilcene National Fish Hatchery where a change in the hatchery water rights led to uncertainty about its production capacity for several years. In 1996, extremely low coho production at Quilcene National Fish Hatchery led to the decision to cancel net pen operations that year. Available production for the net pens from Quilcene National Fish Hatchery has now stabilized and the current net pen production goal of 200,000 smolts is reasonable.

Initially the fish size at release goal was 10 fish per pound. But experience over the years has demonstrated that a lower goal of 15 fish per pound is more appropriate. The revision was made in 1996.

10.4) Actual dates of release and description of release protocols.

Ranges of release dates for a recent five years are as follows:

1995	4/14
1996	no release
1997	5/13
1998	5/4
1999	6/8

Over the years, extending back to when the program began in 1986, release of the coho initially occurred in late May and early June, but in more recent years tended to occur in early to middle May, notwithstanding the release on June 8, 1999. The later-timed releases in late May and June (initial years of the program) were associated with later arrival of smolts to the pens (late March and April) when Dungeness stock was used. The more recent releases in early to middle May reflect the relatively early arrival of Quilcene stock in January (see history of broodstocks in section 6.2.1.). Application of the criterion for release of coho smolts after April 15 (to minimize interaction with Hood Canal summer chum) began in 1999. There was no release in 1996 because fish were not available for the net pens (see section 10.3).

10.5) Fish transportation procedures, if applicable.

The USFWS transports the coho by tanker truck to a dock on the north end of Quilcene Bay (see Quilcene National Fish Hatchery's coho program). The coho are transferred by hose in lots of 1,200 pounds (approximately 24,000 to 36,000 fish at a size of 20 to 30 fish per pound) into each of two approximately 1,000 gallon plastic-lined tanks on a U.S. Navy transport vessel. Loading may be up to approximately 1.2 pounds of fish per gallon. The water in the fish tanks is aerated using air stones and bottled oxygen. Also, during transport over water to the pens, saltwater is siphoned through the tanks, allowing saltwater acclimation to begin during the trip. The fish are quickly transported over water (approximately 10-15 minutes) and the fish are released in the pen through a hose from each holding tank. Any fish mortalities are counted during and after the transfer and generally are less than 1%.

10.6) Acclimation procedures

Acclimation is in the saltwater of Quilcene Bay for the 3 to 4 months the fish are reared in the net pens.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

A total of 90,000 coho are double index, coded wire tagged at USFWS' Quilcene National Fish Hatchery prior to transfer to the net pens. Double index tagging means that 45,000 of the coho receive a coded wire tag and adipose fin clip, and another 45,000 coho receive a coded wire tag and no adipose fin clip. The remaining coho (approximately 110,000 when transfer goal is met) are mass-marked, receiving only adipose fin clips.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed

or approved levels.

Not an issue. Any excess fish can be accommodated within the net pen facilities.

All fish on hand will be released after April 15 to reduce risk of coho predation on summer chum and in compliance with recommendations in section 3.3 of the Summer Chum Salmon Conservation Initiative (WDFW and PNPT Tribes 2000).

10.9) Fish health certification procedures applied pre-release.

Coho yearlings are examined and certified by a NWIFC fish pathologist prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.

There is no risk of flooding or water system failure with net pen facilities.

However, problems associated with noxious phytoplankton or damage to the pen system could require an early release of the coho (section 5.7). Every attempt will be made to avoid early release of fish but in the event of an emergency, the coho will be released by dropping one side of the net to allow easy and rapid egress.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Coho yearling are released after April 15 to reduce risk of potential coho predation on Hood Canal summer chum. Disease prevention and treatment measures are taken to minimize risk of fish disease transfer to the listed species of Hood Canal summer chum and Puget Sound chinook.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of “Performance Indicators” presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified for the program.

Record keeping practices to meet monitoring requirements, described under “Performance Indicators” in Section 1.10, are being reviewed. Monitoring procedures and record keeping will be improved or added where appropriate and if funding is adequate.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Currently available funding, staffing, and support logistics are expected to be adequate to meet the monitoring and evaluation requirements described under “Performance Indicators” in section 1.10, except additional funds would be required to set up phytoplankton monitoring and to support any coho stray rate monitoring and assessment.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

It is anticipated that adherence to the monitoring and record keeping described in section 1.10 will contribute to the minimum likelihood of any genetic and ecological effects on listed fish. In this regard, records of particular value will be dates of fish release (to verify fall releases after April 15 in order to avoid interactions with summer chum in the estuary) and the reports of fish disease testing and certification (to minimize the risk of fish disease transfer to listed species).

SECTION 12. RESEARCH

Not applicable to this program.

12.1) Objective or purpose.

Not applicable

12.2) Cooperating and funding agencies.

Not applicable

12.3) Principle investigator or project supervisor and staff.

Not applicable

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Not applicable

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

Not applicable

12.6) Dates or time period in which research activity occurs.

Not applicable

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Not applicable

12.8) Expected type and effects of take and potential for injury or mortality.

Not applicable

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).

Not applicable

12.10) Alternative methods to achieve project objectives.

Not applicable

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Not applicable

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for

adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Not applicable

SECTION 13. ATTACHMENTS AND CITATIONS

- Allendorf, F.W., D. Bayles, D.L. Bottom, K.P. Currens, C.A. Frissell, D. Hankin, J.A. Lichatowich, W. Nehlsen, P.C. Troter, and T.H. Williams. 1997. Prioritizing Pacific salmon stocks for conservation. *Conservation Biology* Vol. 11 No. 1 p. 140-152.
- Beattie, W., N. Lampsakis, J.Sawicki, C. Weller, B. Tweit, R. Eltrich and J. Long. 1999. Reconstruction of the abundance of Hood Canal coho, 1986 – 96. Draft manuscript report. 32 p.
- Johnson, O.W., W.S. Grant, R.G. Kope, K. Neely, F.W. Waknitz and R.S. Waples. 1997. Status Review of Chum Salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-32. 255 p., plus Appendix.
- Myers, J.M., R.G. Kope, G. J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley and R.S. Waples. 1998. NOAA Technical Memorandum NMFS-NWFSC-35. 443 p.
- Northwest Indian Fisheries Commission and Washington Department of Fish and Wildlife. 1998. Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State. Revision effective March 17, 1998. 22 p.
- Point No Point Treaty Council and Washington Department of Fish and Wildlife. 2000. 2000 Management Framework Plan and Salmon Runs' Status for the Hood Canal Region.
- Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State Salmon and Steelhead Stock Inventory. Olympia. 212 p.
- Washington Department of Fish and Wildlife and Point-No-Point Treaty Tribes. 2000. Summer Chum Salmon Conservation Initiative. An Implementation Plan to Recover Summer Chum salmon in the Hood Canal and Strait of Juan de Fuca. Jim Ames, Gary Graves, Chris Weller editors. 424 p., plus 3 Appendices.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

“I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.”

Name, Title, and Signature of Applicant:

Chris Weller, Fish Biologist, Point No Point Treaty Council

Certified by _____ Date

NOT APPLICABLE. Risk of take is low and no reasonable quantified estimates of take can be made. See section 2.2.3.

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: <u>Summer chum salmon</u> ESU/Population: <u>Hood Canal Summer Chum ESU / Union River</u> Activity: <u>Supplementation</u>				
Location of hatchery activity: <u>George Adams Hatchery / Union River trap/ Huson Spring facility</u>				
Dates of activity: <u>August -May</u> Hatchery program operator: <u>WDFW, Hood Canal Salmon Enhancement Group</u>				
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.

2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).

3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.